FERMATA ENERGY

VGI WORKING GROUP

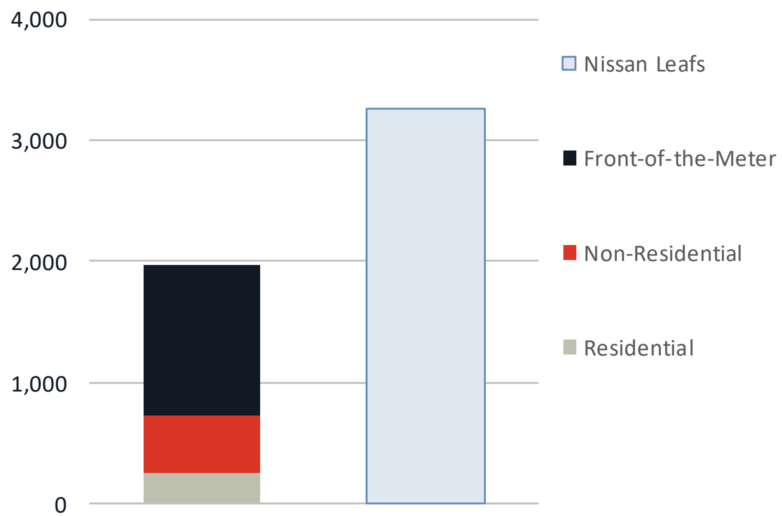
WHAT VGI USE CASES CAN PROVIDE VALUE NOW, AND HOW CAN THAT VALUE BE CAPTURED?

EV RELATIVE STORAGE CAPACITY

The combined energy storage from sales of a single, modest selling EV model is greater than the entire stationary storage industry including all deployments by all companies in all sectors.

- Nissan LEAF has ~16K average annual sales which is about 1/10th the sales of a Nissan Sentra or Tesla Model 3
- 1.6x as much energy storage in LEAFs as in all stationary systems in U.S. as of 2018
- Assuming several bi-directional EVs enter the market at sales comparable to Sentra/Model 3 – energy storage rapidly becomes an abundant resource – assuming there is infrastructure to access it.

Stationary Storage Industry vs. LEAFs on the Road
Cummulative MWh U.S. Deployments (2012-2018)



THINGS TO CONSIDER

1. EVs are in the right place, at the right time.
    - EVs are often in ideal locations to act as a grid resource
    - Cars are parked 95% of the time
    - Cars are often parked where local and system wide peak demand originates – i.e. places and times of human activity.

2. EVs have more than enough energy capacity.
    - Underutilized EV battery capacity is significant and increasing every year.
    - When cars are being driving, they don't go very far. Average work commute is ~13 miles requiring 3 to 4 kWh.
    - While driving patterns remain unchanged, EV batteries are getting bigger. The LEAF battery has almost tripled in size in the last 4 years.

3. EVs are capable of providing grid energy storage.
    - EV's can perform the same technical functions as a stationary battery.
    - Marginal equipment cost of a bidirectional charger vs. unidirectional is very small.
    - Automotive supply chain dwarf's the stationary industry.
    - People are willing to share property for money.

V1G

1. V1G is essential and should be the default starting point, much like energy efficiency vs. renewable energy.
2. V1G optimizes the additional cost of EV charging.
3. V1G can lower the average $/kWh paid by all grid customers by increasing the utilization of generating assets and spreading the fixed cost of infrastructure over more kWh.
4. As with storage and other flexible loads, V1G can increase grid gHg emissions if markets and systems are not designed correctly
5. In some scenarios with large mixes of dispatchable supply such as coal, natural gas, and nuclear energy, V1G and other flexible offtake load could eliminate the need for V2G and energy storage – but this would make the use of intermittent renewable energy sources like wind and solar very challenging.
6. V1G cannot supply power to lower peaks beyond EV charging needs.
7. It can utilize more renewable energy during times of otherwise excess supply, but it cannot save and supply renewable energy when it is needed.
8. V1G cannot provide backup power.
9. Like all load curtailment, determining V1G reductions is not straightforward and requires establishing a theoretical baseline – all results are estimates. This adds complexity and uncertainty to dispatch systems and individual settlements.
10. The V1G constraint is amount available to charge which is often relatively small when compared to amount available to discharge.

V2G

1. More than just “2 x V1G”. It is dispatchable, distributed, mobile energy supply.

2. Can produce value to more than cover the optimized cost of EV charging.

3. Can lower the total $ cost of energy produced for the grid, not just the average $/kWh paid. This means the that the grid is better off with an EV than without – i.e. the EV is a true resource, not just an optimized cost.

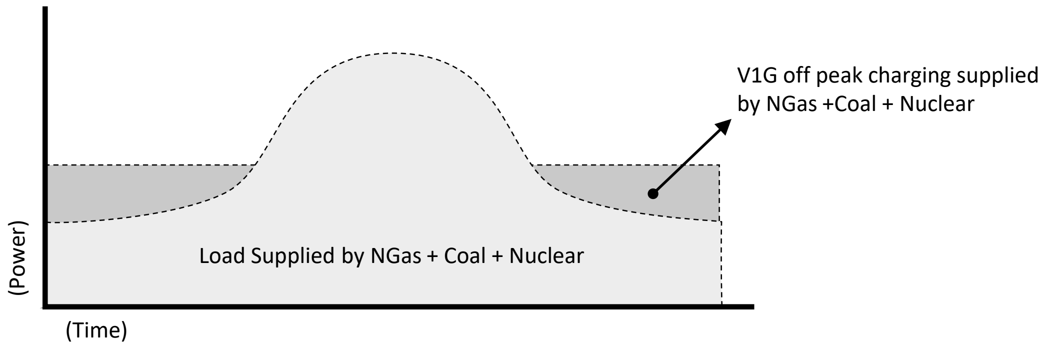
4. Determining V2G contribution is straightforward and can be directly metered – no baselines or guess work.

5. Constraint is KWh SoC – which is growing per EV.

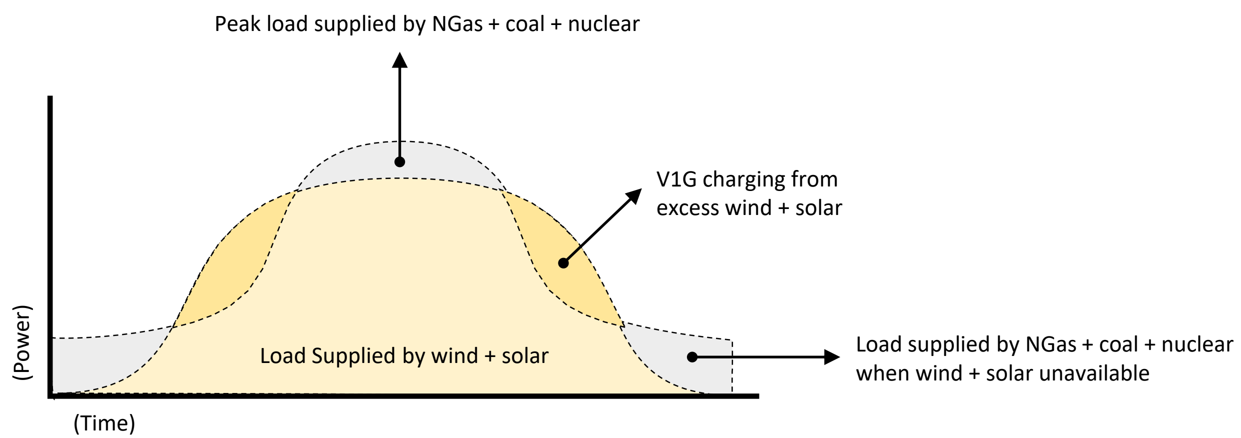
6. EVs qualify for CA storage mandate

7. When EV owners are compensated for an energy storage service from V2G (and to a lesser extent V1G), demand for EVs increases, which increases EV adoption while directly benefiting utility customers.

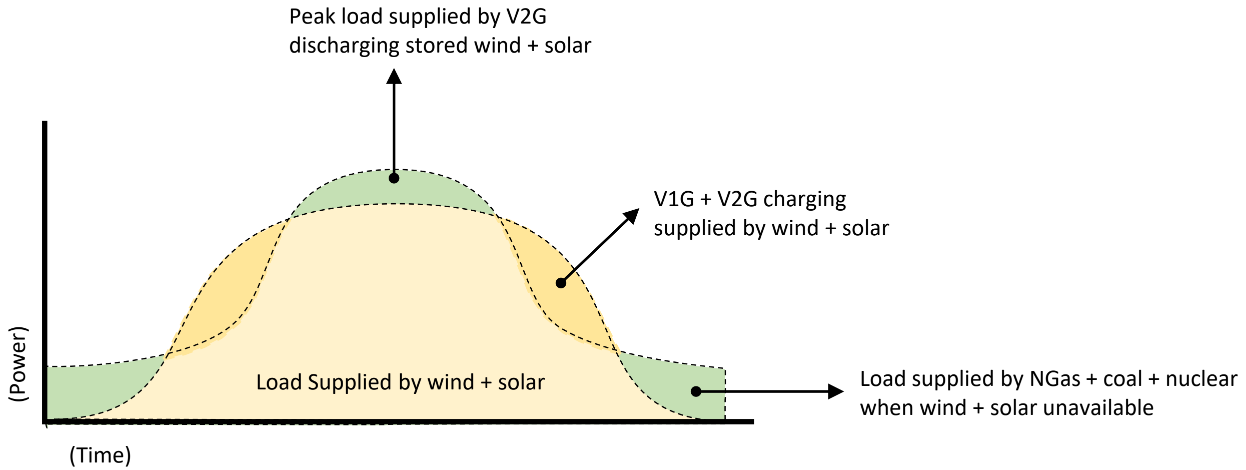
V1G WITH CONVENTIONAL GENERATION



V1G WITH RENEWABLE ENERGY



V2G WITH RENEWABLES ENERGY



COMPARING V1G + V2G CAPACITY

1. Average V2G energy capacity available to discharge vs. V1G charge is 2x to 10x.

2. This does not include V2G's ability to charge and discharge throughout the hour, day, or week. This means V2G has far more potential uptake capacity than V1G as well as greater discharge capacity if an EV can charge between peak events.

V1G / V2G CAPACITY COMPARISON	Charge at Home + Work	Charge at Work Only
EV Driving Efficiency (miles/kWh)	4.00	4.00
Average Commute (miles)	13.00	13.00
kWh used for Commute	3.25	3.25
Max SoC (kWh)	60.00	60.00
Optimized SoC %	80.00%	80.00%
Optimized SoC (kWh)	48.00	48.00
Minimum Reserve SoC %	20%	20%
Minimum Reserve SoC (kWh)	12.00	12.00
Minimum Reserve SoC (miles)	48.00	48.00
Morning Starting SoC (kWh)	48.00	44.75
kWh used for Commute	3.25	3.25
Starting SoC at Work	44.75	41.50
V1G Uptake Capacity to Optimal SoC	3.25	6.50
V1G Uptake Capacity to Max SoC	15.25	18.50
V2G Dcharge Capacity from Optimal SoC	32.75	29.5
V2G Dcharge Capacity from Max SoC	44.75	41.5
V2G Capacity vs. V1G Capacity	10.1x	4.5x
V2G Capacity vs. V1G Capacity	2.9x	2.2x

V2G USE CASES TODAY

- Deploying V2G in the marketplace needs to start with a few “anchor” use cases.
- These anchor use cases act like “killer apps” to produce significant value for customers without the need for major policy shifts, new markets mechanisms, or new utility system control technology.
- Once V2G units have been deployed with anchor use cases, new use cases can be added to the service “stack” since prohibitive fixed costs have been covered by an anchor use case.

Some of these use cases today include:

1. Home backup
    1. Straightforward value proposition for anyone with an EV and a home.
    2. Homeowners routinely pay $5,000 or more to install generators and well over twice that for a home battery storage system.
    3. Cost for a bidirectional home unit is estimated at about $5,500 with installation. An inexpensive level 2 unidirectional is about $2,000 with installation. So, a homeowner, who is going to get a home charger anyway, would pay $3,500 more for the backup. This is $1,500 savings right away, before any incentives.
    4. Main constraint is the lack of a cost-effective hardware product. New cost-effective products are planned for 2020/2021 release.
2. Customer Bill Management
    1. Managing commercial and industrial electricity bills with site located stationary batteries is an established service and industry. This same practice can be done with an EV and bidirectional charger.
    2. To capture this value, chargers must be behind-the-meter and integrated with building load.
    3. Expected customer bill savings in California range from $1,700 – $5,800 per year per EV , with an average of ~$3,500.
    4. Over 200,000 estimated customer sites where V2G customer bill management is applicable.

V1G vs V2G USE CASE SCORING

V1G + V2G should be assessed separately and independently.

1. V1G scores are driven predominantly by an installed base of unidirectional chargers.

2. V2G scores depend on a change in the status quo and the introduction of new technology.

3. V1G is a like a “value” investment for a stock. Like large companies that are undervalued, the large existing base of unidirectional infrastructure is undervalued in the absence of V1G.

4. V2G is a like a “growth” stock. There is a not a large existing base of infrastructure, but the potential value of growing a new technology is significant.

5. While V1G score value is high today because many unidirectional chargers exist, the V2G opportunity will be missed if decisions are solely based on optimizing a status quo.

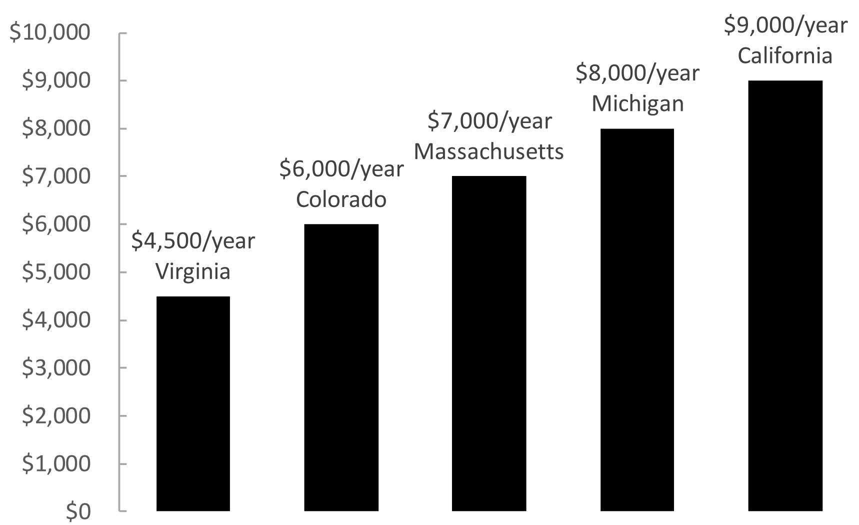
CUSTOMER BILL MANAGEMENT USE CASE

Fermata Operations - EIT Manufacturing Facility, VA

CUSTOMER BILL MANAGEMENT USE CASE

FERMATA OPERATING RESULTS – 5 Months

- In June 2019, Fermata deployed our prototype FE-15 charger and 2018 40kWh Nissan LEAF at EIT manufacturing facility in Danville, VA.
- Utilizing our cloud software's demand charge management application, the system was able to successfully monetize $187.50 by discharging a Nissan LEAF to reduce the peak kW demand portion of EIT's monthly electricity bill.
- This was the maximum dollar amount achievable under the local retail tariff as the full 12.5kW capacity of the charger was successfully applied to reduce the peak event by 12.5 kW, resulting in a 100% performance score. All savings have been verified by comparing EIT's June electricity bill to meter and charger data.
- Demand charge management was performed three times during month, each event lasting approximately 45 minutes with the state of charge of the LEAF battery never falling below 75% in any event.
- Since then, the system continues to function 24/7. As of November 2019, the system has produced $776.51 in savings over five months.
- These results are analyzed pro-forma for different markets using our planned 25kW FE-25 in the chart below. *Note: these are based on average price ranges for specific tariffs. Fermata is currently performing a utility specific proforma for the California and will post this soon.*



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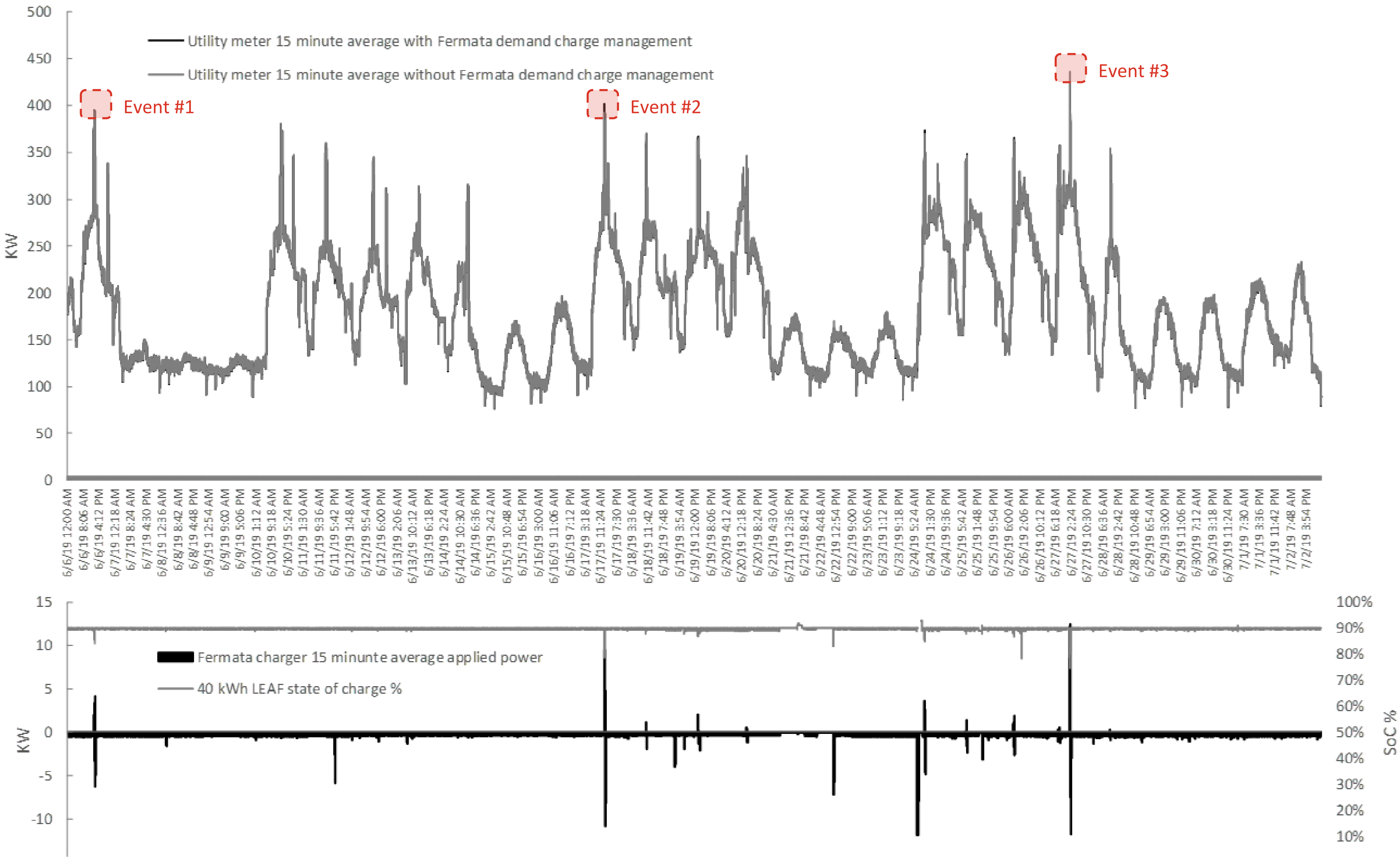


CUSTOMER BILL MANAGEMENT USE CASE

DEMAND CHARGE MANAGEMENT EVENT 3

1:59pm June 27th, 2019

Total time spent discharging:

- 15 minutes

Total time spent charging:

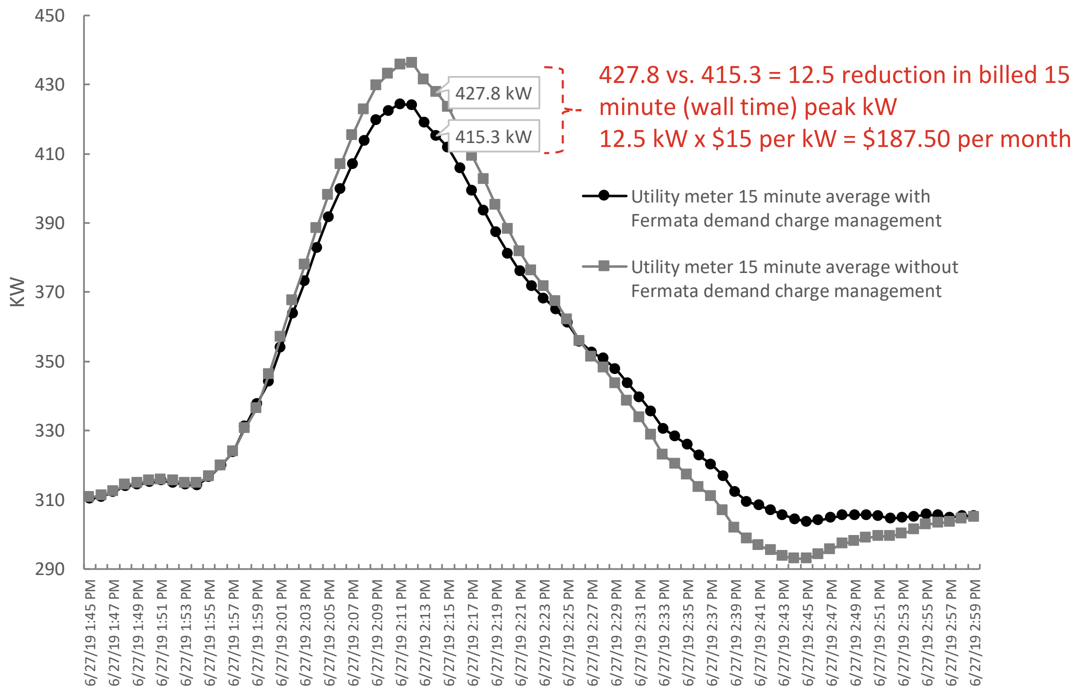
- 30 minutes

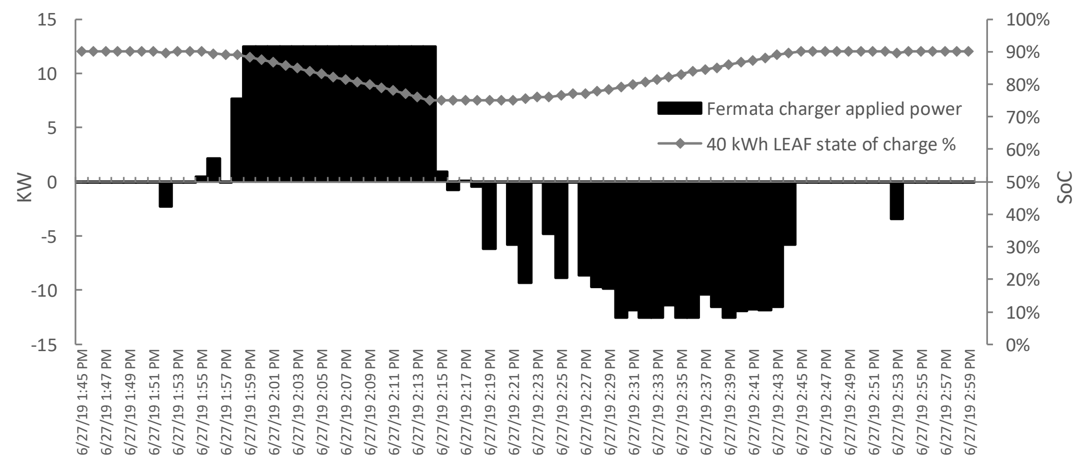
Total event peak kW reduced:

- 12.5 kW

Minimum LEAF state of charge

- 75%





CUSTOMER BILL MANAGEMENT USE CASE

FERMATA OPERATING RESULTS | VERIFIED BY BILL

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Danville Utilities City of Danville, Virginia
8:30 AM - 5:00 PM, Mon-Fri

Collections 434-799-5125 Power Outage 434-773-8300
Billing 434-799-5159 Water/Gas Emergency 434-799-5284
Refuse 434-799-5245
https://www.danvilleutilities.com/

EIT LLC
Service Address 350 SLAYTON AVE

Account-Customer Number	Bill Render Date	Due Date	Amount Due
0075060876-03088218	07/15/2019	08/06/2019	$15,628.84

Previous Balance	$18,421.97
Payments	$18,421.97CR
Credits / Debits	$0.00
Balance Forward	$0.00
Current Charges	$15,628.84
Total Amount Due	**$15,628.84**

Description		$ Amount
Elect Comm - Cust Chg		*$75.00*
Elect Comm - Energy Chg		*$8,129.85*
Elect Comm - PCA		*$622.50*
Electric Summary	$8,827.35	
Demand	$6,375.00	
Water Comm-State W/drawal Fee		*$0.25*
Water Comm-Consump Chg		*$28.80*
Water Comm-Cust Chg		*$70.80*
Water Summary	$99.85	
Wastewater Comm-Consump Chg		*$30.96*
Wastewater Comm-Cust Chg		*$113.00*
Wastewater Summary	$143.96	
Fire Line Charge-Comm		*$22.44*
Fire Line Charge-Comm Summary	$22.44	
Water Comm-State W/drawal Fee		*$0.25*
Water Summary	$0.25	
Recycle/Compost/Yard Fee	$2.00	
Gas Comm - Cust Chg		*$22.30*
Gas Summary	$22.30	
State Utility Tax	$105.01	
Utility Tax - Danville	$30.68	
Total Current Charges	$15,628.84	
Payment - Thank you	$18,421.97CR	

Continued on page 3

Delinquent balances not paid within thirty-five (35) days of the original bill due date will result in termination of utility service without further notice. A delinquent fee of $50 will be charged on bills remaining unpaid after thirty-five (35) days past the original bill due date. No payment extensions / agreements available.

Penalty of $234.43 will be applied if not paid by the Due Date

Account-Customer Number	Bill Render Date	Due Date	Amount Due
0075060876-03088218	07/15/2019	08/06/2019	$15,628.84

GAS THERM FACTOR 1.034000
GAS THERM USED
ELECTRIC POWER COST ADJUSTMENT 0.0050000

Cur.ReadDate	Prev.ReadDate	Meter#	Service	Days	Cur. Read	Prev. Read	Consump	Units	Rate
07/06/2019	06/06/2019	09000748	Electric	30	6402	6319	124500	KWH	E50
07/06/2019	06/06/2019	09000748	Demand	30	0.28	0.28	415.50	KW	E50
07/06/2019	06/06/2019	40048299	Water	30	1995	1983	12	CCF	WME
07/06/2019	06/06/2019	10046533	Fire Line	30	0	0	0	CCF	FFC
07/06/2019	06/06/2019		Wastewater	30	0		12		SI1
07/06/2019	06/06/2019		Refuse Collect	30	0		0		R03
07/06/2019	06/06/2019	00032201	Natural Gas	30	35152	35152	0	CCF	G20

Billed kW peak demand reduced 12.5 kW by discharging Nissan LEAF into the building to reduce metered peak load.

415.5 kW (billed from grid)
\+ 12.5 kW from LEAF (“behind the meter”, unbilled)
= 427.0 kW actual building demand during peak.

12.5 kW x $~15 per kW = $187.50 per month savings

FERMATA OPERATING PRO FORMA ANALYSIS

Current Operations in Danville, VA

12.5	x	$15	=	$188	x	12	=	$2,250
Charger kW		*$ per kW price*		*Monthly Savings per charger*		*months*		*Annual Savings per Charger*

Same system above in California

12.5	x	$30	=	$375	x	12	=	$4,500
Charger kW		*$ per kW price*		*Monthly Savings per charger*		*months*		*Annual Savings per Charger*

25 kW system in California

25	x	$30	=	$750	x	12	=	$9,000
Charger kW		*$ per kW price*		*Monthly Savings per charger*		*months*		*Annual Savings per Charger*